Plow-Plant Method of CORN CULTURE

H. M. Wilson and C. S. Winkelblech

CORNELL EXTENSION BULLETIN 1031
NEW YORK STATE COLLEGE OF AGRICULTURE

SUMMARY

1. Average yields of plow-planted corn are slightly higher than yields from conventionally planted corn.
2. Plow-planting permits earlier planting, saves fitting time, maintains soil tilth and reduces dangers of soil packing and erosion.
3. Essentials for successful plow-planting include:
   a. Early planting—one week before normal planting date is desirable.
   b. Good plowing—a properly adjusted plow is essential.
   c. Friable soil tilth—cloddy or very stony fields are not suitable.
   d. Planter properly mounted and adjusted
   e. Fertilizer banded at the side and below the seed.
   f. Cultipacking and weeding when the corn is six to eight inches high.

Plow-Plant Method of CORN CULTURE

H. M. Wilson and C. S. Winkelblech

A few years ago no one would have dared make statements such as these: "Land for corn, if well plowed, does not need to be harrowed or disced. Plowing and planting may be done in one operation. Ordinary plows and planters can be adapted for this purpose. In most instances plow-planted corn yields as well, or better, than conventionally planted corn. Cultivation and harvest are not problems. There is a saving in production costs and the system has other advantages."

Research carried on over the past eight years indicates that the statements above are true and that the plow-plant method of corn culture should be considered where favorable conditions exist. This bulletin reviews studies which led to that conclusion and suggests methods that are most likely to prove successful.

HISTORY AND EXTENT OF RESEARCH

In 1951 R. B. Musgrave of Cornell University first adapted standard farm equipment to plow and plant corn in one operation. Since 1951 yields of conventionally planted and plow-planted corn have been compared at the Aurora and Mt. Pleasant Agronomy farms. The effects of weather and time of planting also have been observed. A three year experiment at Marcellus has measured erosion and water runoff losses under the two systems. Special studies have compared growth rates, root development, soil tilth, soil temperature and soil moisture.

In 1955, 1956 and 1957 the Departments of Agronomy and Agricultural Engineering established field trials in 46 counties throughout the state. In 1958 the two departments began "Methodology" studies to learn the effect of various tillage and fertilizing practices on growth rates and the kind of tillage required after the corn is up. The results of these studies are discussed on the following pages.

WHY PLOW-PLANTING PRODUCES CORN

Principles Involved

Corn is a coarse feeder and does not require a fine seed bed. Regardless of how it is planted, however, corn does best on soils that are mellow and not excessively lumpy or stony. Land should not be so steep that equipment cannot operate efficiently. Plow-planting is feasible under these conditions.

Corn is a tropical plant and needs heat to germinate and grow. In most of New York State the odds are four to one that May weather will be wet and cold. Nevertheless, early planting is essential if the crop is to reach maturity. This can be done if the seed is placed in a well aerated position where excess moisture does not prevent the sun from warming the soil. Figure 1 shows the effect of soil moisture on soil temperature.

In 1958, a year with growing season temperatures 3.2 degrees below normal and with 6.0 inches extra rainfall, corn that was plow-planted on May 14 yielded 143 bushels of mature ears that required no drying. On an adjoining conventionally planted field where wet weather delayed fitting and planting until June 10, the ears contained over 50 percent moisture at harvest time. The wet corn could not be put in the crib and was almost a total loss.

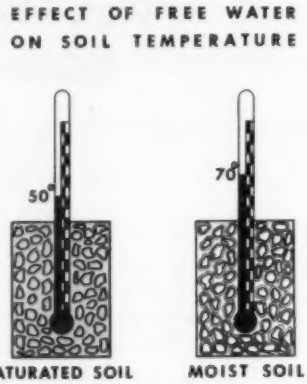


FIGURE 1. Wet soil may be 20 degrees colder than soil that contains less water.

FIGURE 2. The ridged surface of a well plowed field is warm because water seldom stands on the crown of the furrows.

HOW PRINCIPLES ARE PUT INTO PRACTICE

Good Plowing Is Essential

As the plow turns the furrow it breaks up lumps, granulates the soil, and leaves a series of smooth small ridges (figure 2). Since water seldom stands on the ridges the unsaturated soil is usually warm.

The Planter Prepares the Seed Bed

Contrary to popular opinion, plow-planted corn is not placed in loose soil. A narrow band on both sides of the seed is worked and leveled by the fertilizer and seed placement shoes and is leveled by the press wheel. Since the seed is in a depression (figure 3), harmful drying is unlikely.

FIGURE 3. Corn is planted in a depression made by the planter shoe. Therefore, harmful drying is unlikely.

Should hard rains occur, free water is quickly absorbed by the surrounding loose soil.

IF YOU WANT TO TRY PLOW PLANTING

Decide Whether Your Soils Are Suited

Plow-planting is best adapted for fields that are only moderately steep, stony or cloddy. The better the tilth the better the job. While the system will work on gravel, its greatest value is on soils that are inclined to be wet and cold in the spring. Clay may need to be worked at the right moisture level. Thick sod is not a disadvantage —in fact it is desirable.

Plant Early

One of the biggest advantages of plow-planting is that it may be done when soil is too wet for fitting. Planting a few days in advance of the usual date for the last killing frost of spring has produced the highest yields. When corn is small it will stand much frost, but a September freeze kills it. Early plow-planting invariably produces the best crops. A planting date a week earlier than normal is about right.

Adjust Your Plow

Plow-planting is only for good plowmen. A properly adjusted plow turns smooth furrows, pulverizes lumps and prepares an excellent foundation for a seed bed. Rough plowing leaves balks, air pockets and exposed trash. The most common causes of poor plowing are plow not level, hitch too high or too low, jointers not adjusted and cutting too wide. Furrow depth should be about half the width. A side hill hitch is needed on sloping land.

Allow Time to Assemble Equipment

A single row planter and a three bottom plow are used and one row is planted on each round. Therefore, when 14-inch plows are used, rows are 42 inches apart. With 12-inch plows, the row width is 36 inches. Because different plows and tractors have different framework, no detailed design can be prepared. If late planting is unavoidable because of adverse weather conditions, the machine should be built so that it can be converted to a conventional planter easily, or arrangements should be made to have a conventional planter on hand.

There are, however, two basic requirements that must be met:

1. Since the unit should be aligned to plant on the furrow, and this can only be determined by trial and error. the bar to which the planter is attached must be long enough to permit horizontal adjustment.

2. A flexible linkage is required to prevent breaking when the planter rides over obstructions.

PLANTING EQUIPMENT

Plow-Mounted

The planter may be mounted on the plow. Figure 4 shows a plow mounted unit in operation. With this method the plow and planter are both controlled through the tractor hydraulic system. Mechanical lift plows cannot handle the additional weight of the planter.

Figures 5 and 6 show two methods of assembling a plow mounted unit that provide the basic requirements of horizontal adjustment and flexible linkage.

Tractor-Mounted

If preferred, the planter and fertilizer unit may be attached to the tractor rather than the plow. Corn is planted on a furrow plowed in the previous round as shown in Figure 7. A remote

FIGURE 4. The compact arrangement of the plow-mounted unit is maneuverable and allows the planter to follow the crown of the furrow accurately.

FIGURE 5. The square bar is hinged on the plow frame to permit flotation. The planter can be moved horizontally on the bar for proper furrow alignment.

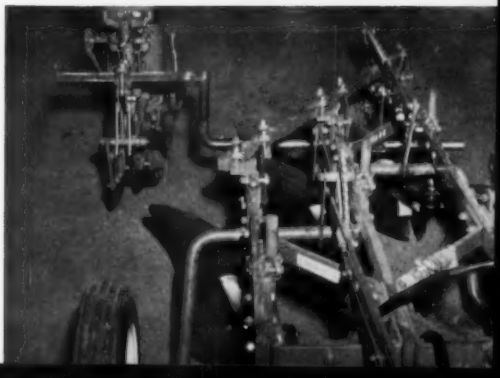


FIGURE 6. The long crank that carries the planter can be adjusted horizontally and is free to rotate through a small arc so that the planter can ride over obstructions.

FIGURE 7. Parallel linkage (1) and a remote hydraulic cylinder (2) raise and lower the planter.

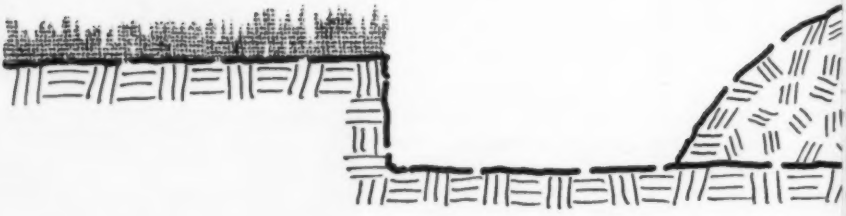


FIGURE 9. Fertilizer banded on the left rat

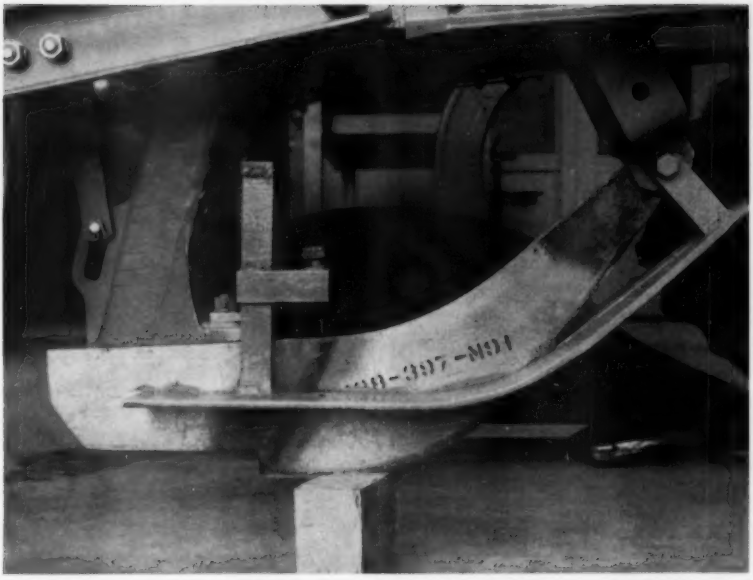
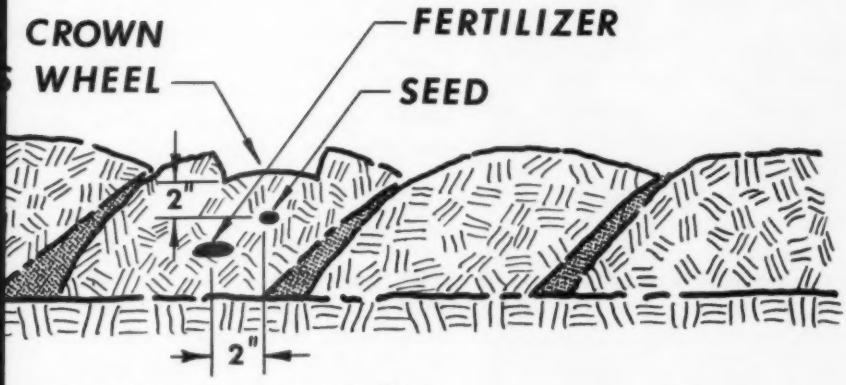


FIGURE 8. A curved leveler on the planter shoe allows more uniform seed placement. The leveler that is made from sheet steel should be slightly wider than the press wheel.



an on the right of the seed seems desirable.

hydraulic unit (2) and parallel linkage (1) are required to raise and lower the planter.

Both the plow-mounted and the tractor-mounted equipment are satisfactory and selection is a matter of personal choice. A side hill hitch may be needed to maintain uniform furrow and corn row width on sloping land.

Desirable Features

A depth gauge (figure 8) attached to the planter shoe assures more uniform seed coverage and improves the action of the press wheel. The gauge, which can be of one-fourth inch sheet steel, should be slightly wider than the press wheel; it should have a leading surface gradually curved upward and should be set to cover the seed one and one-half to two inches deep. The actual depth of the seed is influenced by the shape of the shoe, the weight of the planting unit, and soil moisture conditions.

Standard fertilizer placement for corn is a band two inches to the side and two inches deeper than the seed. With plow-planting, fertilizer on the left of the seed (figure 9) may be desirable because it is nearly in the center of the furrow. If placed on the right, fertilizer is close to the loose zone between furrows where the soil may be dry. In a recent test fertilizer on the left yielded six more bushels of corn than fertilizer on the right. It may not be important, but, why take chances?

AFTER THE CORN IS UP

When the corn is from six to eight inches high, it should be cultipacked and weeded to smooth the surface and destroy small weeds. Since corn is planted in a depression and will stand abuse at this stage, it is not injured. That statement is difficult to believe. Most people simply cannot bring themselves to go over standing corn with a cultipacker and weeder. Figures 10, 11, and 12 show a plow planted corn row prior to cultipacking, the cultipacker-weeder in action, and the same area two weeks after the corn was cultivated. Stand counts before and after cultipacking showed no corn was torn out. The stalks have all straightened up, weeds received a bad setback and the ground surface was adequately smoothed. Cultipacking and weeding might be compared with the first cultivation of conventional corn in that both destroy weeds. Cultipacking, however, requires less time because precision is not so important. It can be done with only minor attention to the position of the row and without danger of tearing out small corn plants.

In this study some plots were not cultipacked. Cultivation was almost impossible and weed control was out of the question. Some of the corn was buried by sloppy cultivation. Average yields of non cultipacked plots were 26 bushels less than those that were cultipacked.

FIGURE 10. Early in the growing season, when the weather is cold and wet, loose ridged soil between the rows is desirable.

FIGURE 11. A combination cultipacker-weeder smooths the surface and destroys weeds. Corn is bent but not broken or uprooted because it was standing in the depressed seed zone.

FIGURE 12. Two weeks after cultipacking the corn has straightened and no stalks are missing.

LATER TREATMENTS

Weed Control Sprays

If 2-4-D is used to control broad leaf weeds it should be applied after the corn is cultipacked and weeded. If sprayed before cultipacking, some stalks might be broken for 2-4-D makes corn temporarily brittle. The effects of new chemicals that control grass as well as broad leaf weeds have not been tested on plow-planted corn.

Cultivating

After a field is cultipacked it may be cultivated as easily as land that is conventionally fitted. On the first cultivation, set the teeth to throw dirt toward the row to bury weeds and fill any depressions that may be left. Two-row cultivators may be used without difficulty if a reasonably good job of plow-planting was done. (Figure 13).

Harvesting

At harvest time the ground surface of plow-planted land is as smooth as conventionally fitted land. (Figure 14). As in the case of cultivation, two-row corn pickers may be used since plow-planted rows are remarkably uniform. An exception might be on steep slopes where side slippage in planting caused uneven row width.

FIGURE 13. The cultipacked corn in the foreground was as easy to cultivate as the conventionally planted corn on the right.

FIGURE 14. From cultipacking through harvest, plow-planted corn is handled in the same way as conventionally planted corn.

YIELDS FROM PLOW-PLANTING

As shown in table 1, average yields of plow-planted corn are slightly higher than those obtained by conventional planting. As is usually the case, however, average figures do not tell the whole story. In some of the trials treatments were used that were found to be undesirable. The greatest increases from plow-planting have been obtained in wet years. Late plow-planting almost always yields less than conventional planting. In some of the field trials comparative plots were not planted the same day. Essential treatments such as cultipacking and approved fertilizer treatment were sometimes not used. There have been instances when, for no apparent reason, plow-planting has been definitely inferior.

If recommended treatments are used, however, plow-planted yields should be at least as good as conventionally planted yields. There is reason to believe that, as more experience is obtained, there will be a significant difference in favor of plow-planting.

Table I

Comparative Yields of Conventional and Plow-Planted Corn

Location	Period		Conventional Bushels per acre	Plow-Planted Bushels per acre
Aurora	Average	1951—1958	83.4	92.7
Mt. Pleasant	Average	1955—1956	58.0	52.4
Marcellus	Average	1957—1958	104.6	102.6
12 Field trials		1956	66.4	68.4
22 Field trials		1957	67.0	69.0
		Mean	75.9	77.0

ADVANTAGES OF PLOW-PLANTING

1. Permits early planting in wet seasons
2. Fitting costs are reduced five to ten dollars per acre
3. There is less wheel traffic to pack the soil
4. Soil is maintained in better tilth
5. Erosion and water runoff are reduced
6. Some weed species are less troublesome
7. Yields are slightly higher

OTHER MINIMUM TILLAGE METHODS

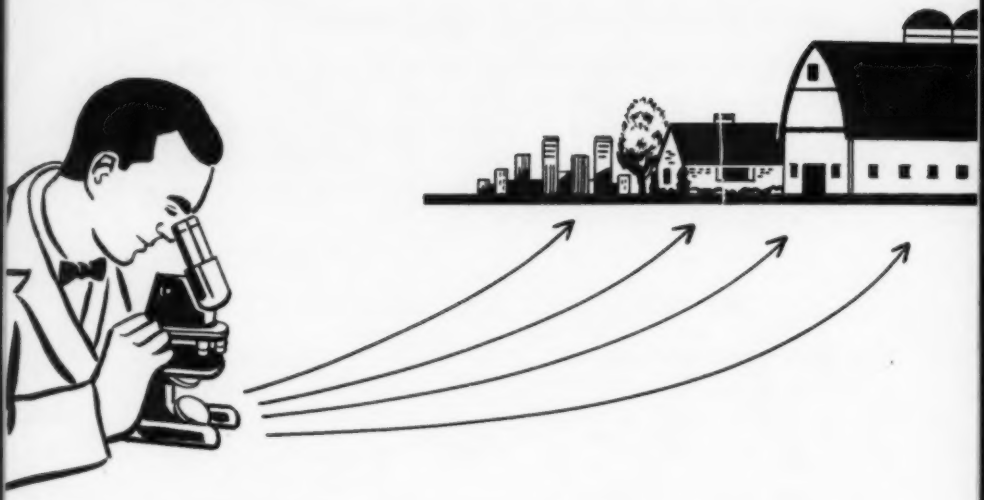
Not everyone is equipped, or will care to try, plow-planting. These people might consider:

1. Once-over harrowing with a plank, or other leveling device dragged behind. The champion corn grower of New York uses this system.
2. Wheel track planting. This is widely used in some mid-western states and has shown good results in a limited number of New York trials. With this system a two row planter plants corn in the tractor wheel tracks. With most tractors the wheels cannot be narrowed to the desired row width but special idler packing wheels can be put on the tractor.

REMEMBER

The Success of Any Minimum Tillage Method Depends on the Quality of Plowing

A publication of the
New York State College of Agriculture,
a unit of the State University,
at Cornell University
Ithaca, New York



FOR more than a half century, the Cooperative Extension Service has helped to translate the results of scientific research into better farming and homemaking practices. Your Extension Specialists and Agents, in cooperation with the New York State Colleges of Agriculture and Home Economics, the U.S. Department of Agriculture, and farm and urban people throughout the State, are partners in progress. Through them, and through Extension publications such as this, the people of the State can keep pace with the rapid strides in science and technology that apply to our agriculture and our homes.

Cooperative Extension Service, New York State College of Agriculture at Cornell University and the U. S. Deparment of Agriculture cooperating. In furtherance of Acts of Congress May 8, June 20, 1914. M. C. Bond, Director of Extension, Ithaca, New York.

PS-10M